

## TEACHING ADULTS WITH SEVERE AND PROFOUND RETARDATION TO EXIT THEIR HOMES UPON HEARING THE FIRE ALARM

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Prompting, modeling, and differential reinforcement with client-chosen rewards were used to teach 3 nonverbal people with severe to profound mental retardation to exit their group homes at the sound of the house fire alarm, using a multiple baseline design. All 3 participants learned to exit independently in less than 2 min in all experimenter-initiated surprise fire drills and in the majority of staff-initiated surprise fire drills. Each participant was also able to exit from five areas of the house from which teaching was not done.

**DESCRIPTORS:** mentally retarded adults, developmentally disabled adults, safety, fire safety, severely mentally retarded

Learning to exit safely during a fire is a crucial skill for people with developmental disabilities who are preparing to live in the community. Considerable success has been achieved in teaching fire-exiting skills to children and adults with mild and moderate mental retardation (some of whom were blind) (Haney & Jones, 1982; Jones, Kazdin, & Haney, 1981a, 1981b; Jones, Sisson, & Van Hasselt, 1984; Jones, Van Hasselt, & Sisson, 1984; Katz & Singh, 1986; Matson, 1980). Unfortunately, however, some reports of attempts to teach this complex skill to people with severe and profound mental retardation have indicated only moderate success (Haney & Jones, 1982; Rae & Roll, 1985). Two other studies with 1 subject each have reported greater success (Cohen, 1984; Holburn & Dougher, 1985) but have not provided experimental evidence of the effects of the teaching procedures.

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Requests for reprints and/or checklists of the fire-exiting teaching procedures should be sent to the first author at the Department of Human Development and Family Life, University of Kansas, Lawrence, Kansas 66045.

The primary purpose of this study was to extend previous work by experimentally evaluating a procedure for teaching nonverbal people with severe and profound retardation to exit their homes quickly during surprise fire drills. Additionally, the study evaluated whether (a) participants could exit during surprise fire drills from locations where training was not conducted, (b) the skill would generalize to staff-initiated fire drills during which the experimenter was not present, and (c) the fire-exiting skill would be maintained over time with the use of regular fire drills.

### METHOD

#### *Participants and Setting*

The 3 participants were chosen because of their inability to exit in response to house fire drills. Randy was a 25-year-old man with profound/severe mental retardation, cerebral palsy, spasticity, mild quadriplegia, and psychomotor retardation. He followed a few simple commands like "stand up" and "come here," but had no expressive language. He fed himself but had no other independent self-care skills. Lenny was a 40-year-old man with severe mental retardation, cerebral palsy, and hypothyroid. He was nonverbal but communicated using head nods and gestures, and followed simple commands. Lenny completed most self-care skills with supervision and minimal prompting. Dan was a 23-year-old man with profound/severe mental retardation, cerebral palsy, vasomotor instability,

and growth retardation. He followed a few simple commands, but had no expressive language except prompted use of the signs for eat and drink. Dan required maximal assistance with all self-care skills except eating. All 3 participants had difficulty walking. Informed consent was obtained from the participants' legal guardians in accordance with the standards developed by the University of Kansas Advisory Committee on Human Experimentation. Informed consent was not obtained from the participants because of their limited receptive and expressive language.

The study was implemented in the men's group homes. Randy lived in Home 1 with nine housemates, and Lenny and Dan lived in Home 2 with four other housemates. Both homes were designed to approximate single-family dwellings and were equipped with manual and smoke-activated fire alarms that sounded at the fire station as well as in the home. After evaluating the homes' fire safety features, local fire safety experts recommended that residents be taught to walk out within 2 min at the sound of the alarm.

### *Testing Situations*

The effects of the teaching procedures were measured during experimenter-initiated fire drills and staff-initiated fire drills. In experimenter-initiated fire drills, the house fire alarm was sounded by an experimenter at differing times and without warning to residents. Staff hid from the participants just before the alarm was sounded and remained out of sight for 6 min at Home 2 and 5 min at Home 1. The 6- and 5-min times were selected to provide participants in each home with ample time to exit independently if they were to do so. After the time had elapsed, the experimenter and staff members used the least intrusive prompt required to get each remaining participant out of the house. Prompts were used only if necessary and in the following sequence: verbal, gestural, light physical, and physical prompt. After all participants were at the meeting place, the alarm was turned off and the participants were prompted to return to the house. No praise or rewards were given to any participants at this time.

*Dependent variables.* Data were collected on (a) whether each participant independently exited and arrived at the predesignated outside meeting place and (b) the amount of time taken to do so.

*Observations.* During baseline fire drills, two observers, one inside the house and one outside, began timing at the sound of the fire alarm. Both observers remained out of sight as much as possible and independently recorded the name of each participant who exited the home (crossed the threshold of the door) in less than 5 min for Home 1 and in less than 6 min for Home 2. Agreement between the two observers on this was 100%.

During the fire drills conducted after each participant had been trained, the outside observer also recorded the exact amount of time (to the nearest second) taken for each participant to exit. A second outside observer was added during 31% of these drills to assess reliability. Agreements between observers on the time participants took to exit were 95% for Randy, 91% for Lenny, and 95% for Dan.

*Generalization probes.* During baseline and after training, participants were tested on their ability to exit from five locations in the home from which training was not done (each participant's bedroom and four other rooms or halls at varied distances from the exit doors). These probes were conducted and observed as above, with one exception: Just prior to the drill, the experimenter asked the participant to come to one of the specific generalization locations (for an unrelated reason so as not to cue him about the drill). Then, the experimenter got out of sight and continued with the probe as described above.

*Staff-initiated fire drills.* Unannounced staff-initiated fire drills were conducted monthly as required by state law. These drills were continued throughout the study. During those drills conducted in the day or evening, staff set off the alarm and then proceeded to check bedrooms and close doors. This task took approximately 30 to 50 s, during which all clients, even those in their bedrooms, were given an opportunity to respond independently to the alarm. After this time had elapsed, staff prompted only those clients who had not begun to exit (i.e., stand up from a chair and/

or start walking towards the door). Those clients who had begun to get out on their own were allowed to continue doing so. When everyone was at the meeting place, the alarm was turned off and the clients were prompted to return to the home. During nighttime fire drills, when all clients were in bed, staff waited 30 s after the fire alarm sounded (to give clients a chance to respond independently) before beginning the room checks and prompts to exit.

During all drills, one staff person recorded the time taken for all clients to gather at the meeting place and the names of those clients who exited without prompts. Another staff member verified each report by reading it and signing it if in agreement. Unfortunately, no independent checks for reliability of these data were conducted.

### *Teaching Procedures*

Participants were taught to exit independently at the sound of the fire alarm from locations of increasing distances from the most accessible exit door. The first teaching location was 6 ft from the exit door, the next was 12 ft from the exit door, then 24 ft, 36 ft, and 42 ft. The final location included three different places: wherever the participant was seated or standing at the beginning of the session and two other locations frequented by the participant, such as a favorite chair (but excluding locations from which generalization was tested).

A tape recording of the house fire alarm was used during teaching to approximate what the participants would hear during a real fire emergency. The tape recording had a 10-s "lead" before the alarm sounded so that the experimenter could turn it on and then have time to return to a desired location. Rewards used during teaching were selected by participants from a menu of preferred items prior to each teaching session (cf. Pace, Ivancic, Edwards, Iwata, & Page, 1985).

Teaching sessions included approximately five trials (of exiting at the sound of the taped alarm) and were held at different times of the day and evening, in varied weather conditions, and in the presence of varying combinations of staff and cli-

ents. The participants were taught in two phases from each teaching location. Phase I entailed teaching with a model, and Phase II entailed teaching without a model. After criterion was met for both teaching phases at a teaching location, the participant was then taught from the next teaching location in the sequence.

*Phase I: Teaching with a model.* In Phase I, participants were taught to go to the door and then to the meeting place at the sound of the alarm after the experimenter modeled the behavior. The experimenter started each trial by bringing the participant to the teaching location, turning on the hidden tape recorder(s), and returning to the participant. When the alarm sounded, the experimenter jogged to the exit door. If the participant then walked to the door, the experimenter praised him just after he crossed the threshold. If the participant did not start walking toward the door within 10 s, the experimenter prompted him using the least intrusive prompt necessary. Prompts were used in the following sequence: verbal ("[{name}], fire, go out"), gestural (pointing to the door), light physical (one touch or gentle push towards the door), and physical prompt (the least amount of physical assistance required to get the client out). Regardless of the amount of prompting used to get the participant to the door, the experimenter praised him after he crossed the threshold.

At this time, with both the experimenter and the participant outside the exit door, the experimenter jogged to the meeting place. If the participant followed and arrived at the meeting place, the experimenter praised and rewarded him with a previously chosen edible. If the participant did not start walking toward the meeting place within 10 s, the experimenter prompted (as above) and then praised the participant upon arriving. When the participant walked from a teaching location out the door and then to the meeting place, without prompts (but with a model), in less than 2 min, and on three consecutive trials, the experimenter proceeded to Phase II teaching from that location.

*Phase II: Teaching without a model.* In Phase II, participants were taught to walk from a teaching location to the meeting place at the sound of the

alarm, without experimenter modeling. The experimenter started each trial by bringing the participant to the teaching location, turning on the tape recorder(s), and getting to the outside of the exit door without being seen by the participant. The tape-recorded alarm did not sound until the experimenter was out of sight. If, after the alarm sounded, the experimenter saw that the participant was walking toward the door, the experimenter went to the meeting place and continued to remain out of sight. If 10 s or so (depending on the time it took for the participant to stand up from a chair, his walking speed, and the distance from the particular teaching location to the door) passed and the experimenter did not see the participant walking towards the door, the experimenter came in and prompted (using the same prompt sequence as when teaching with a model). The experimenter then went to the meeting place, out of sight of the participant. Once again, the experimenter waited to see if the participant would walk independently to the meeting place. If not, the experimenter prompted. When the participant arrived at the meeting place, the alarm was turned off and he received praise. A previously chosen reward was given if no prompts were required to get the participant from the teaching location to the meeting place.

When the participant walked from a teaching location out the door and then to the meeting place with no model, no prompts, and within 2 min in three consecutive trials occurring in each of three consecutive sessions, teaching began from the next teaching location in the sequence until teaching was completed at all teaching locations.

*Reliability of the independent variable.* To assess the use of the teaching procedures, during a number of teaching sessions both the experimenter and an independent observer recorded on a checklist whether the procedures were implemented as described above. The average percentage of items on the checklist recorded as having been implemented as described was 99%, and the agreement between the experimenter's records and the observer's records was 100%.

*Design.* A within-subject multiple baseline design (Baer, Wolf, & Risley, 1968) across subjects

was used to evaluate the effectiveness of the teaching procedure.

## RESULTS

### *Acquisition of the Fire-Evacuation Skill*

Randy met the teaching criterion (with and without a model from each training location) after 338 trials (61 sessions). Lenny met criterion after 125 trials (29 sessions). Dan met criterion after 455 trials (89 sessions).

### *Exiting During Experimenter-Initiated Fire Drill Probes*

Figure 1 shows the effects of teaching on exiting during experimenter-initiated fire drill probes. During baseline, the participants normally did not exit independently within 5 or 6 min after the alarm was sounded and, therefore, required prompts. The only exceptions were one fire drill during which Lenny exited independently, and one or two fire drills for each participant during which exiting was assisted by other clients in the homes. After meeting the teaching criterion, all participants exited independently during fire drill probes. In 93% (39 of 42) of the fire drills after teaching, participants exited in under 2 min. Randy maintained the exiting skill for 16 months, Lenny for 14 months, and Dan for 3 months.

Before teaching, five fire drill probes were conducted with each participant from generalization locations where teaching was not to occur (designated by triangles in Figure 1). Prompts were required for all participants to exit during these probes. After teaching was completed, fire drill probes were again conducted from locations where training had never occurred, and all 3 participants exited independently from these locations in under 2 min (with the exception of once with Dan when he required 4 min and 42 s to exit because a wheelchair blocked his exit route).

### *Exiting During Staff-Initiated Fire Drills*

Exits during staff-initiated fire drills also showed improvement after training. During baseline, Lenny and Dan required prompts to exit in every staff-

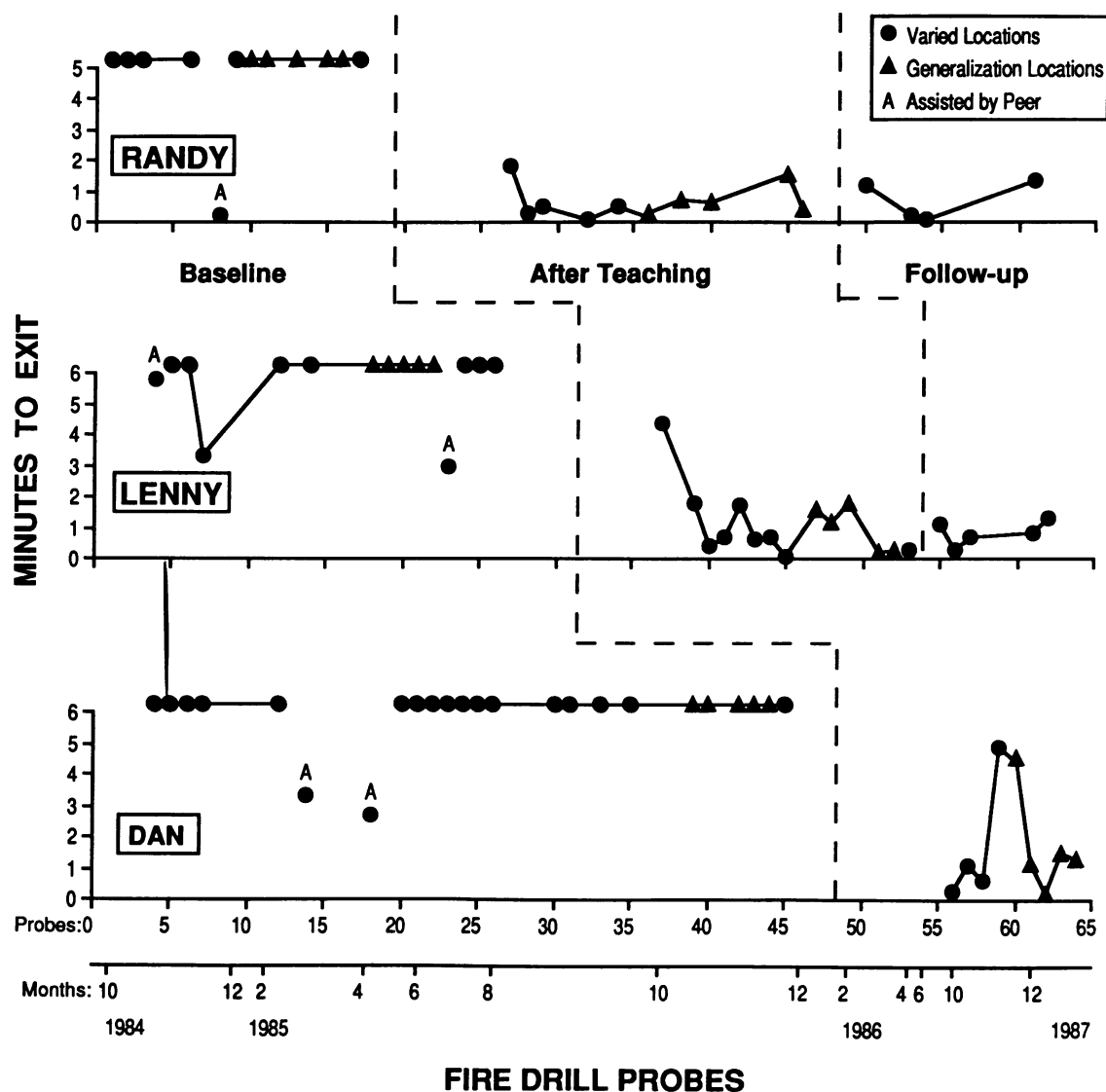


Figure 1. Number of minutes to exit for each participant during experimenter-initiated fire drill probes. Participants were prompted to exit if they did not do so independently within 5 min (for Randy) and 6 min (for Lenny and Dan).

initiated drill. Randy required prompts to exit during six fire drills (one of which occurred at night) and exited independently during two drills. While participants were being taught to exit, Randy and Lenny exited independently in three of five drills and one of two drills, respectively. Dan required prompts to exit in all drills during the teaching. After meeting the teaching criterion, Randy exited independently in nine of 15 drills, Lenny exited independently in seven of nine drills, and Dan exited independently in three of three drills. The

posttraining drills included three nighttime fire drills; Randy exited independently in one of two, and Lenny required prompts to exit in one drill.

## DISCUSSION

This study demonstrated a method for teaching nonverbal persons with severe to profound retardation to exit at the sound of a fire alarm. The exiting skill generalized to experimenter-initiated surprise fire drills using the real house alarm and

to most staff-initiated surprise fire drills. Additionally, clients were able to exit from locations in the house where training was not done, and the exiting skill was shown to maintain after training for a range of 3 to 16 months.

Acquisition of the exiting skill took a considerable amount of time for 2 of the 3 participants. Fortunately, the teaching procedures are easy to implement; since this study, several direct-care staff have implemented the procedures without difficulty. Group teaching, however, may increase the efficiency of training.

There were several features of the procedures that may have contributed to their effectiveness. First, the use of a recording of the actual house alarm during teaching may have enhanced generalization to the real fire drills (programming a common stimulus, as suggested by Stokes & Baer, 1977). Second, teaching and testing from different locations in the house, at different times of the day, in different weather, and with different staff and clients also may have enhanced generalization (training sufficient exemplars, Stokes & Baer, 1977). Third, occasional fire drills were opportunities for intermittent practice of the exiting skill and may have promoted maintenance. In two previous studies, maintenance of exiting skills was attributed to occasional testing: Haney and Jones (1982) succeeded in maintaining exiting skills at posttraining levels for 6 months, and Katz and Singh (1986) retained 100% correct exiting skills for 6 to 18 weeks. Declines in performance after 4 to 5 months occurred in most studies in which occasional testing and/or review after training was not done (Jones *et al.*, 1981a, 1981b; Jones, Van Hasselt, & Sisson, 1984; Jones & Haney, 1984).

A generalization problem that this study failed to address sufficiently involved nighttime exiting. In staff-initiated fire drills held after training, Randy was the only participant to exit independently from his bed during a night drill. Jones, Van Hasselt, and Sisson (1984) had similar results even after training blind participants with moderate and mild retardation from their dormitory beds. Only in a follow-up study, during which some of the same

participants were retrained and engaged in extensive practice, were they able to exit independently from their beds in a nighttime fire drill. Thus, nighttime conditions appear to be sufficiently different from daytime and may necessitate training specific to those conditions. Nighttime fire emergency responses deserve further investigation because fires, fire injuries, and fire fatalities occur more often at night than at any other time (National Fire Safety Council, Inc., 1982).

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